

CLAIMS

1. A device for monitoring molecular contamination, said device comprising:
a measurement element comprising a material having a surface area greater
than 100 square meters per gram; and
5 a sensing circuit connected to said measurement element and providing an
output signal characteristic of molecular contamination on the surface of said material.
2. The device of claim 1 wherein said material comprises an aerogel.
3. The device of claim 1 wherein said material comprises carbon.
4. The device of claim 1 wherein said material comprises activated carbon.
- 10 5. The device of claim 1 wherein said material comprises a polymer based
on diphenyl p-phenylene oxide.
6. The device of claim 1 wherein said material comprises silica.
7. The device of claim 1 wherein said material comprises a resorcinol-
formaldehyde organic polymer.
- 15 8. The device of claim 1 wherein said material comprises alumina.
9. The device of claim 1 wherein said material comprises a nanocellular
carbon foam.
10. The device of claim 1 wherein said material is more than 1 nm thick.
11. The device of claim 1 wherein said material is less than 100 microns
20 thick.
12. The device of claim 1 wherein said material has a surface area
concentration above 400 m²/g.
13. The device of claim 1 wherein said material has a surface area
concentration above 1000 m²/g.
- 25 14. The device of claim 1 wherein said material has a surface area
concentration above 1500 m²/g.
15. The device of claim 1 wherein said measurement element includes a
piezoelectric crystal having a detecting surface and said material is formed on said
detecting surface.
- 30 16. The device of claim 15 wherein said sensing circuit comprises a surface
wave acoustic (SAW) sensor circuit.

17. The device of claim 1 wherein said sensing circuit comprises a quartz crystal microbalance (QCM) sensor circuit.

18. The device of claim 1 further comprising a chemically selective membrane located between a source of said molecular contaminant and said material.

5 19. The device of claim 1 wherein said material is doped material.

20. The device of claim 19 wherein said material is doped with a specific molecule which interacts with a particular contaminant molecule.

21. The device of claim 19 wherein said material is doped aerogel material.

22. A method of monitoring molecular contamination, said method
10 comprising:

providing a measurement element comprising a material having a surface area greater than 100 square meters per gram;

collecting molecular contamination on said surface area; and
electronically detecting said molecular contamination.

15 23. A method as in claim 22 wherein said electronically detecting comprises exciting an acoustic wave in said measurement element.

24. A method for monitoring molecular contamination, the method comprising:

providing a piezoelectric sensor;

20 locating a high-surface-area measurement element on said piezoelectric sensor; and

detecting a molecular contaminant on said measurement element.

25 25. The method of claim 24 wherein said detecting comprises generating an electrical signal indicative of an accumulated quantity of said received molecular contaminant on said measurement element.

26. The method of claim 25 wherein said detecting comprises exciting an acoustic wave in said piezoelectric sensor.

27. The method of claim 25 wherein said detecting comprises exciting an acoustic wave on the surface of said piezoelectric sensor.

30 28. The method of claim 25 further comprising inhibiting contaminants other than a selected molecular contaminant from reaching said measurement element.